Television weathercasters as potentially prominent science communicators

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Television weathercasters as science communicators

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An important, but mostly overlooked aspect of science communication is the potential role US television weathercasters may perform. In some cases, these specialists may be the only source of scientific information that some people encounter on a regular basis. Audience research indicates that the weathercast is the most-watched part of the local newscast and the primary reason people choose a local television news product. But very little is known about the qualifications of weathercasters as a group and their inclinations as individuals to educate viewers about scientific topics. This study begins with results from the largest survey ever conducted about television weathercasters. Most of them say their broadcasts are appropriate venues for teaching their audiences about science, and most of them are already doing so. Other results provide a baseline foundation on a variety of other work-related factors, including the consistent public service function for most television weathercasters that includes science communication in their communities. Finally, the study discusses the increasing number of initiatives recently being developed to formalize this potentially powerful role of television weathercasters as prominent science communicators.

1. Introduction

On this May evening an increasingly common, yet still remarkable event occurred on many local US television stations. Weather interrupted paid programming and led local newscasts. From the border of Mexico to Canada and beyond, an impressive squall line of thunderstorms was developing, lighting up radar screens for more than a thousand miles with the now familiar zig-zag of red, yellow and green. Severe weather threatened people and property from the Upper Peninsula of Michigan to the Rio Grande Valley of Texas. A tornado touched down in central Texas, killing one man. Winds up to 80 mph and softball-size hail pummeled the upper Midwest. Millions of dollars in damage occurred. In times like these, television weathercasters can play a crucial, sometimes life-saving role.

When 65 twisters ravaged central Oklahoma in a 6-hour period in May 1999 destroying more than 8,000 buildings, the number of deaths was actually surprisingly low (Henson, 2000). Henson credits warnings from the National Weather Service, which gave an average lead time of 32 minutes, and local television and radio stations that went into saturation

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coverage. Four years later when another tornado outbreak occurred in Kansas City, again television weathercasters were credited with saving lives (Barnhardt, 2003). The same is true with broadcasts during the active 2005 hurricane season. The convergence of television's influence and the watch/warning system has helped lead to a dramatic drop in deaths from all weather-related events, except flash flooding (Henson, 2001).

While their function as the most prominent weather communicators in US society may seem obvious, in many cases television weathercasters also report on many other science-related topics. As often the only member of their newsrooms who has much, if any science training, many television weathercasters are called on to comment on a wide range of topics beyond their specialty, meteorology. That partial list includes astronomy, biodiversity, cloning, cosmology, physics, geography, medicine and even plate tectonics and volcanism. The Space Shuttle disintegration over Texas provided just such an example of this when many local weathercasters were called on to explain the radar images which picked up the debris as if it were precipitation falling from the sky. More than half of television weathercasters say they have already reported on global climate change (Wilson, 2002). Some local weathercasters believe they may be the only regular science source for the public (Ryan, 2000), yet we know very little about this potential role.

According to audience surveys, weather is the most important part of the newscast (Smith, 2000). Consultant research also shows the audience is most interested in weather from their local newscast (O'Malley, 1999). On-air weathercasters are so important in many television markets that competing stations regularly hire away the top rated anchor from across town for much more money, despite the legal obstacles from no-compete clauses that are designed to prevent that from occurring (Saunders, 2004). Given the demands, visibility, and potential impact of this exclusive group of people, the dearth of scholarly research about this group of science specialists is surprising. As the author of the comprehensive book, *Television Weathercasting* (1990) wrote, "I was appalled to find that television weather was all but ignored as a subject of serious inquiry" (Henson, 1990: ix).

2. Literature review

Television weather demands an unusual combination of skills: relaxed and conversational but energetic and upbeat, and it's a lot more difficult than it looks (Mirsky, 2000). Being a good scientist is only part of the task and few non-television meteorologists understand the demands of the broadcast business. Being only an entertainer, as previous episodes in television weathercasting allowed and encouraged, is no longer enough to do the job well either. Proprietary consultant research abounds, but it is not made widely available. Consultants agree that weathercasters are the primary reason people choose a local television news product, but there is little understanding as to who these visible science communicators are and how they work.

A search of academic journals found limited research on television weather. Since 1985, when the *Journal of Broadcasting* became the *Journal of Broadcasting and Electronic Media*, 284 articles have been published in this peer-reviewed journal, but a key word search discovered that none of them included television weather. A hand-check of every article written in the journal from 1956 to 1984 showed the same result: not one scholarly article about television weathercasting.

Journalism (and Mass Communication) Quarterly (*JQ*) has published three articles on the subject, all being published in a six-year period from 1976 to 1982. In 1976, Tan reported that television is the medium most often used for weather information, but the reporting was

inadequate for many users. The primary complaint in that research was that weather was only available during the actual news program itself (Tan, 1976), which is no longer true with the proliferation of 24-hour weather information over-the-air and on the Web. A second article analyzed the accuracy of weathercasters' forecasts and found that next day forecasts for precipitation and temperature were generally accurate but unreliable beyond one day (Gantz, 1982). In that article, Gantz also noted that very few changes were made in the weather forecast between the early and late newscasts, which might be an interesting avenue for exploration in today's milieu. A third *JQ* article measured what audiences remembered from their evening weathercasts. This study found that viewers retained very little of the information presented, but that overall most viewers were "satisfied" with television weather as it was (Hyatt et al., 1978). Finally, a fourth *JQ* article focused on newspaper coverage of weather, and concluded that more space was being devoted to weather in daily newspapers, primarily because of the influence of *USA Today*'s expansive coverage (Anderson and Anderson, 1986).

An article in the *European Journal of Communication* measured the impact of seasonal and specific weather events on television viewing, but did not specifically look at weathercasters. In that study, researchers concluded that weather must be factored in any predictive model of media use, because it is one of the most important structuring features of social life (Roe and Vandebosch, 1996).

While scholarly journals in journalism and communication have eschewed the study of television weathercasters, peer-reviewed journals in other disciplines have given the topic more study, although few such papers have appeared recently. The *Bulletin of the American Meteorological Society* (*BAMS*) has published the most peer-reviewed articles related to television weather. *BAMS* is published by the American Meteorological Society (AMS), a large umbrella organization with more than 11,000 members spanning a range of disciplines from oceanography to weather and forecasting. More than 30 articles about television weather have appeared in *BAMS* over the past 65 years beginning with "Popularizing the Weather Broadcast" (Fidler, 1938). The number of articles regarding television weather in that publication peaked in the late 1950s and 1960s when the AMS was creating its credentialing program for on-air personalities. An ongoing concern in *BAMS* is the value of "professional vs. nonprofessional" weathercasts (Beebe, 1970; Booker, 1962). As defined by these authors, professional weathercasters were those who had a meteorology degree and the AMS seal of approval. Using ratings data, both concluded that audiences preferred professional weather programs over those "presented by amateurs."

The National Weather Association (NWA) is the other large organization that many television weathercasters join and it publishes a monthly newsletter and a peer-reviewed journal. *National Weather Digest* has published one peer-reviewed article that reported findings from a survey of 74 television weathercasters in the top 40 markets (Lazalier, 1982). Results from this current research will be contrasted with findings from that smaller survey from 20 years ago, since it is the only other comparable study in the literature.

Another scientific journal also occasionally considers aspects of television weathercasting. *Weather and Forecasting* is more likely to focus on the technical issues related to forecasting, modeling and radar, for instance, rather than the actual workings of the job of being a television weathercaster, but has published two articles by the same author, both analyzing which television weathercasters are most likely to deviate from National Weather Service forecasts (Driscoll, 1988, 1986).

Some other science journals, such as *Climatic Change*, have recently included articles that looked at how weather is reported on television, but not specifically at the role of weathercasters. One author found a discernable increase in coverage of televised weather, especially since 1988, when "global warming exploded on the news agenda" (Ungar, 1999: 136).

Trade magazines, such as *Communicator*, the publication of the Radio and Television News Directors' Association and *Programmer*, the publication of the National Association of Television Program Executives, have also given sporadic attention to television weather. The most relevant article was written by geographers who measured weathercasters' "important link in the chain of communication of weather data and forecasts," and includes some survey data that can be compared to the current study (Trapassc et al., 1985: 16). Popular publications on weather and television weather proliferate. *TV Guide* has published a large number of popular articles on television weather, most of them focusing on the personalities of the weather anchors (Simon, 1989), but not on the actual work and potential impact of weathercasters.

In a report to the surgeon general, LoSciuto (1972) argued that television weathercasters represent one type of media communication whose impact has not been researched enough. His interest focused primarily on public preparation for weather-related events, but his concern for more research remains justified 34 years later, as television weathercasters have become even more influential.

3. Earning science credentials

One ongoing theme in television weather that this study investigates is the role of voluntary seals of approval that weathercasters can earn and display on-air for credibility. Henson's history of television weather (1990) illustrates that weathercasters have experienced many incarnations—from silly to scientific. In hopes of returning professionalism to television weathercasting, the AMS began its Seal of Approval program in 1957. It was conferred on those weathercasters who met the Society's guidelines for "completeness, clarity and professionalism." The requirements for the first seals issued in 1959 were a written application and a film clip of one representative weathercast. The sample weathercasts were evaluated by an AMS committee and seals awarded to qualified applicants. The AMS seal process remains in effect today, although it too has gone through much metamorphosis in the past 40 years. Since 1959, the AMS has certified more than 1,300 television weathercasters as well as 150 in radio (AMS, 2003).

Requirements were too rigorous for many "wannabes" (Monmonier, 1999). In February 1982, the National Weather Association (NWA) created an alternate credential for weathercasters. The NWA began in 1976 as a more informal organization than the AMS and initially its seal required no meteorology degree or passing a written exam, which allowed more weathercasters to join. Although its seal is considered inferior by some meteorologists, the NWA has awarded more than 800 seals since 1982 (NWA, 2006) and now requires a written exam and re-certification and training to keep the seal, something the AMS had not required for its original seal.

The AMS, however, is conducting a major overhaul of its seal program aimed precisely at making its seal holders more than just weather forecasters. The new Certified Broadcast Meteorologist (CBM) credential began in January 2005 and requires weathercasters to earn ongoing professional credit to keep it. Testing for the CBM includes questions on a broader range of scientific topics. The goal of this new credential is "to help newsrooms see weathercasters as their station scientists" (AMS, 2006b).

4. Research goals and methods

"Television Weathercasters as Potentially Prominent Science Communicators" is descriptive research that explores an untapped area of scholarly study and emulates other attempts to

understand how specific aspects of science and journalism work. Baseline data on these highly visible, yet often neglected science communicators are offered as a snapshot of the profession at the beginning of the 21st century in the same way data on regional environment reporters provided the first clue on those specialists (Sachsman et al., 2002). The findings provide context for how science is communicated on many local television stations today and may also be useful for future longitudinal analyses the way larger studies of journalists themselves have provided ongoing opportunities to identify trends, patterns and changes (Weaver and Wilhoit, 1996). As such, this study attempts to answer a number of basic questions:

- Who are television weathercasters? What kind of science training and expertise do they bring to their work? How does possessing a scientific credential, such as a seal of approval, impact the work of television weathercasters? Are there measurable differences in their work duties, status, longevity and prominence? In order to form baseline data, what are the basic duties of television weathercasters and what kind of roles do they serve as science communicators? Finally, the study considers the many ways television weathercasters are being targeted by outside organizations that already recognize the potential of their high-profile positions.

The first part of this study used a four-page survey mailed to 445 randomly selected local television weathercasters. The *Broadcasting and Cable Yearbook* was used to identify all network affiliates and independent stations in the United States with local newscasts. A rotating system of prime-time/main anchor, morning/noon anchor, and weekend weather anchor was used to identify one person at each station to receive the survey. Once the position was selected, a personal phone call was made to the station to get the correct name and spelling of the person currently in that position. Then a survey specifically addressed to that person was mailed along with a cover letter identifying the investigator and the reasons for the inquiry.

A total of 217 television weathercasters responded to the survey for a response rate of 48.8 percent. This is a high response given that this was a one-time mailing and no postcard reminders were mailed out. Mail survey research typically garners a response rate of 19–27 percent with postcard follow-ups (Dillman, 2000). The goal of a probability sample is a systematic selection procedure to represent the population with a minimum of sampling error. Overall this sample of weathercasters represents 127 television markets in 47 US states, and is the largest survey of television weathercasters in the scholarly literature. Beyond the survey data, which serve as a baseline, other data are included to further illustrate this potential role television weathercasters perform as science communicators.

5. Results and discussion

Many of the survey questions answer "who" television weathercasters are and "how" they work, and whether science communication is an important aspect of their jobs. Just over half of the weathercasters (54 percent) said they had earned their highest degree in meteorology/atmospheric sciences. This figure is nearly identical to a smaller survey of just large market weathercasters conducted in 1982 in which 52 percent self-identified as meteorologists (Lazalier, 1982). Another 10 percent of television weathercasters in this sample chose other sciences as their highest degree and 5 percent indicated a combination of journalism and science. More than two-thirds of television weathercasters in this sample have earned some sort of science degree as their highest degree (others may also have science degrees in previous schooling). Nearly a quarter of this sample (23 percent) reported journalism/mass communications as their highest degree. It is expected that the

number of television weathercasters with interdisciplinary degrees will continue to rise as successful programs, such as Mississippi State University's with more than 1,500 graduates and another 300 enrolled, continue to grow and receive more acceptance. The sample is well educated, with 17 percent reporting their highest degree as a graduate degree and another 72 percent with a bachelor's degree, and many television weathercasters say they also seek out additional science training and expertise through a variety of workshops and seminars.

Other variables measured included: market size, newscast position, science training and background, earned credential from either AMS and/or NWA seal of approval programs, experience, and gender. Market size was broken into four commonly used categories in television research. Twenty-two percent of the sample was from the top 25 markets, 16 percent from markets 26–50, 32 percent from markets 51–100 and 30 percent from the smaller markets 101 and above.

Just over half of the sample (51 percent) said they were the main/prime-time weather anchor, while 25 percent self-identified as primarily the weekend anchor and 20 percent were responsible for the morning and noon weathercasts. The remaining 4 percent identified as part-time weather anchors, largely performing other reporting tasks in the newsroom.

Only 7 percent of weathercasters said their television stations employed science or environment reporters, confirming that they may be the only science trained member in the newsroom and called upon for scientific expertise. This number is comparable to recent regional studies of environment reporters that show very few television stations employ such specialists (Sachsman et al., 2002). About a fifth of the sample of television weathercasters said their jobs already included regular environment reporting with a mean number of three stories a month.

Weathercasters in the sample also said that they lead their local newscasts on average 3 days per month. More than nine times out of ten the reason is severe weather (93 percent). Snow takes second place for leading the newscast (46 percent). Large market weathercasters reported a mean of 3.5 days a month of weather leading their local news, compared to just under 3 days for all other markets, but no statistical significance was found with this, or any other tested variable, suggesting that weather and the weathercaster consistently play a prominent public role in local news.

The Chromakey ceiling

While technically a demographic characteristic and used as an independent variable for further analyses, gender plays such a pivotal role in this sample and in the history of television weather (Henson, 1990) that it is reported as its own finding. One previous study reported "women break the glass ceiling in TV news" (Stone, 1997). But data from this survey reveal this same kind of progress does not hold true in the area of television weather. Only 15 percent of the sample is female ($n = 33$). This low figure is consistent with other, limited data. The AMS reports that only 10 percent of its television seal holders are women (4 percent in radio). "Female meteorologists" represented 1 percent and "female broadcasters" accounted for 11 percent of a smaller sample of weathercasters 20 yesars ago (Lazalier, 1982). Women have fared much better historically, when they comprised the majority of weathercasters in the mid 1950s (Henson, 2002), and in other areas of broadcasting. Women now make up 36 percent of the overall television news force (Stone, 2001). That's up from 13 percent in 1972, two years after the Federal Communications Commission extended its affirmative action rule to include women. Women now comprise a quarter of all television news directors and 29 percent of network correspondents (Huff, 2002).

Not only are the numbers of women weathercasters low, further analyses discovered that very few of them are prime-time weather anchors (Table 1). More than half the women in this

Table 1. Newscast position by gender

Newscast position		Gender	
		Female	Male
Prime time	Count	9	102
	Perent within gender	28.1%	57.0%
	Residual	−7.8	7.8
Morning/noon	Count	6	39
	Percent within gender	18.8%	21.8%
	Residual	−.8	.8
Weekend	Count	17	38
	Percent within gender	53.1%	21.2%
	Residual	—	—

χ^2 (2) = 15.0, p <.001.

sample are working weekends, compared to one-fifth of the men. Only a quarter of the women are prime-time weather anchors while 57 percent of the men have the same position. This association is statistically significant ($\chi^2(2) = 15.0$, $p < .001$). While working weekends is not considered a senior position, it often also requires reporting three days during the week. This untapped opportunity represents perhaps the greatest potential for increased science reporting in general and for an increased profile for women weathercasters specifically.

Women also tend to be clustered in larger markets. More than a third of the women in the sample are working in large urban markets, compared to one-fifth of the men. Similarly, a much smaller percentage of women are in markets 101+ (15 percent) compared to a third of the men. While this association is not statistically significant, it is a striking contrast to a smaller survey of television weathercasters 20 years ago in which a third of women were employed in the smallest markets (Trapassc et al., 1985).

Very few women have earned the AMS seal of approval (Table 2). Just over a quarter of women have the seal compared to more than half the men, which is also statistically significant ($\chi^2(1) = 7.87$, $p < .005$). This is not true of the NWA seal of approval, where nearly identical proportions of women and men have earned that credential. The AMS seal is the most often requested by television news directors and these data suggest this remains an obstacle for many women seeking seniority in television weather.

Table 2. AMS seal by gender

AMS seal		Gender	
		Female	Male
Yes	Count	9	99
	Percent within gender	27.3%	53.8%
	Residual	−7.4	7.4
No	Count	24	85
	Percent within gender	72.7%	46.2%
	Residual	7.4	−7.4

$\chi^2(1) = 7.87$, $p < .005$.

Impact of science credentials

Many television weathercasters choose to acquire one (or both) of the two science credentials available for on-air promotion. More than half of this sample had earned the AMS seal of approval (n = 109), and another 57 had earned the NWA seal (26 had both), meaning two-thirds of these weathercasters had successfully earned a science credential on top of their educational requirements. Conventional wisdom has suggested that having a scientific seal of approval leads to more security and status for television weathercasters, although such a theory had never previously been measured.

In this survey, weathercasters were given a fill-in-the-blank option to answer how long they had worked at their current station. The mean length of service in their current position for all 217 weathercasters was 5½ years (x = 5.5). However, the mean is skewed because of three weathercasters who said they had been at their current stations 27, 28, and 29 years. No other respondents answered above 20 years. The median is a much more accurate reflection of the mobility of television weathercasters. Half of all weathercasters had been at their current station 3 years or less, and the mode for the sample was 1 year (26). Including those who said less than 1 year, the number rises to 50, or 23 percent of television weathercasters, who have been at their current station one year or less. According to other research, television news is an itinerant profession (Stone, 2002), and this is certainly true for weathercasters.

In this sample, having the AMS science credential alone is statistically correlated with longer tenure at the current station, but only compared to those who have neither seal (Table 3). Having the NWA credential alone does result in a slightly higher mean, but is not statistically significant with any other group. Those with both science credentials actually have shorter tenures at their current station than the mean, which may seem counterintuitive, but not to many weathercasters. "These are the go-getters in the industry who believe having both science credentials makes them more marketable and are likely to move on and up more often," said one member of the AMS Board of Certification at a meeting. The 77 weathercasters with neither seal have the shortest tenure of all groups. Some members of this group may be working on their requirements for a seal of approval, and tracking those numbers over time will allow for comparisons about the perceived importance of science credentials in popular media.

Having the AMS credential is also associated with market size ($\chi^2(3) = 15.53$, $p < .001$). Weathercasters in larger television markets are much more likely to have the AMS seal. Many advertisements for television weathercasters now often demand "AMS seal required" in addition to previous experience. The reasons why news directors, especially those in larger markets, prefer this credential is an area ripe for further research. No such association was discovered with the NWA seal of approval.

The AMS introduced a new seal in January 2005, the Certified Broadcast Meteorologist (CBM) specifically directed at promoting the role of the local weathercaster as the "station scientist," which will provide future opportunities to track the status of these individuals compared to other television weathercasters.

Table 3. Seal by longevity

Mean for all weathercasters	5.5 Years
With AMS seal only (n = 82)	7.7 Years
With NWA seal only (n = 31)	6.1 Years
With both seals (n = 26)	4.0 Years
With no seal (n = 77)	3.4 Years

$p < .001$ (AMS seal with no seal only).

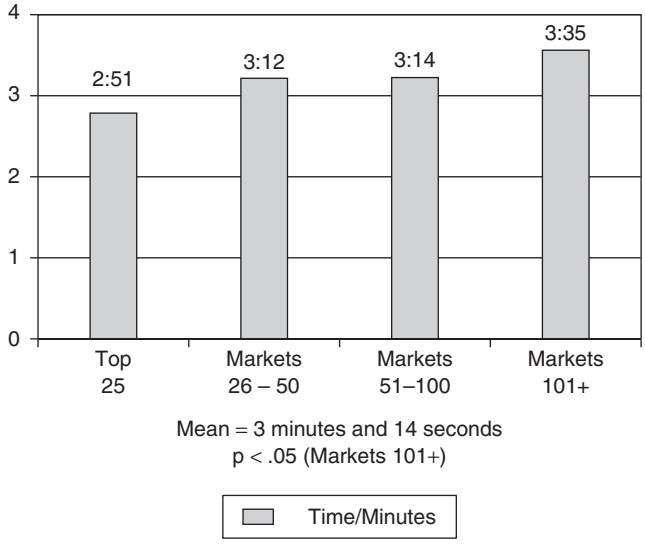

Figure 1. Mean amount of time for the main weather segment for weathercasters in this sample (n = 217) by market size.

While the AMS science credential was correlated in this sample with certain outcomes—notably, longer tenure at the current station and working in larger markets, these data alone cannot answer why this correlation exists. Further study would be useful in this area, especially measuring how television news directors value science credentials.

As subsequent data analyses show, however, having one or both of these science credentials had no other discernable impact on any other aspects of being a television weathercaster, which may be surprising to most weathercasters, as well as to the two accrediting organizations. While some people certainly value the seal as evidence of scientific credibility, its impact on how weathercasters work is negligible.

Time for science on television

Television is a business of precious time. A local 30-minute newscast likely contains only 18–20 minutes of content when calculating commercial advertising (Smith, 2000). Although consultants report the weather segment is the most-watched part of the local news, it is often considered the "accordion," because it gets squeezed or stretched regularly (Sealls, 1994–5). One television weathercaster reported having 10 minutes of air time during television's early days (Youle, 1952), but only one previous study has measured weathercasters' on-air time. In that smaller study of large market weathercasters, the average amount of time reported for the weathercast was 3 minutes and 23 seconds (Lazalier, 1982).

That figure is very close to the mean amount of time for the main weather segment for all 217 weathercasters in this sample of 3 minutes and 14 seconds. Only one tested variable had any statistical impact on this amount of time a weathercaster receives in the primary block. The data show large market weathercasters get the least amount of time on average to report weather in this regular segment, 2 minutes and 51 seconds (Figure 1). Small market weathercasters get more time, 3 minutes and 35 seconds, which using ANOVA tests to compare means, is statistically significant with all other market sizes ($p < .05$). This finding confirms what many in the business have long suspected, but was never before documented: in smaller markets, the television weathercaster is given more time and prominence for the main

weather segment in the typical 30-minute newscast. This higher profile for television weathercasters in smaller markets also offers unexplored opportunities for increasing the visibility of science communication in those communities.

No other variable had any other discernable impact on the amount of time a weathercaster is given in a newscast. The other variables tested included: having either seal of approval, amount of experience, newscast position (early evening, late show, noon, weekend), degree/training or gender.

The mean figure of 3 minutes and 14 seconds is only for the main weather block and does not include other live shots, teases, hits, or special reports that television weathercasters regularly produce. These extra hits are especially evident in larger markets where there are multiple evening newscasts.

In smaller markets, television weathercasters shoulder more responsibility than their colleagues in larger markets. The mean number of full-time weathercasters on staff for the top 50 markets is three, but for markets 101+, it's only two. While the extra on-air time allocated to smaller market weathercasters for their main weather segment can be seen as an opportunity, these results also offer an unexplored venue for increased science communication in larger markets. Not only are there more shows to fill, but with a full-time staff of four in most top 25 markets (and three in the top 100 markets), weathercasters in these markets also have the occasion to report as part of their regular duties. Only during times of crises do all weathercasters work at the same time on just the weather. At other times these specialists may be reporting on other topics, including science. At KYW-TV in Philadelphia, Chief Meteorologist Kathy Orr says her staff of four takes turns reporting on science and environment issues every week. Even in medium-sized markets, such as Sioux Falls, South Dakota, Chief Meteorologist Jay Trobec says his staff of four weathercasters at KELO-TV produces at least one science story a day, again with rotating responsibilities.

Science communicators in the community

Data from this sample indicate the daily duties of television weathercasters are strikingly similar across all tested variables, and present other unexplored avenues of potential science communication beyond just the on-air aspect of their work. Weathercasters were asked to assign a percentage to fill-in-the-blank questions about their average work responsibilities. Almost half of their day (47 percent) is spent preparing computer graphics for the weathercast. These days competence in weathercasting implies skill in computer graphics as well as an understanding of the atmosphere (Monmonier, 1999). The proliferation of graphics is an "if you've got it, use it" mentality on the part of station executives who approve spending for state-of-the-art weather technology (Bowser, 1997). Many times weathercasters also create graphics that are used to help explain other science stories in the news. On 12 July 2004, when a forest fire was billowing smoke west of Fort Collins, Colorado, KCNC-TV (Denver) meteorologist Jennifer Zeppelin built a graphic for the newsroom utilizing satellite images showing where the fire started and how the smoke would be moving over the city. On another day, she built a graphic for a reporter who needed to visualize on a map how a criminal was supposed to remain tethered to his home neighborhood by an ankle bracelet. Each time the graphic was essential in telling the news story and weathercasters may be the most graphic savvy individuals in television newsrooms.

Actual weather forecasting takes up 36 percent of a typical weathercaster's day. Community service places a consistent and strong third at 15 percent of daily responsibilities for all television weathercasters. A wide range of activities fit into this category, but the most common are visits to schools and speaking before community groups.

The data reveal consistent percentages for all duties: actual weather forecasting comprises only a third of almost all television weathercaster duties. Clearly, then, understanding meteorology is not the only key to success for a television weathercaster. None of the independent variables—market size, gender, science credential, experience, or newscast, had any statistical impact on the daily duties of television weathercasters. So, it seems, when a television weathercaster changes jobs, the station call letters, technology, community, and local weather may differ, but the actual duties of the position will be remarkably familiar.

The consistent 15 percent of weathercaster time spent on community service suggests this is one of the regular duties of today's weathercasters and may be a place where significant science communication occurs. In subsequent interviews, most weathercasters say they enjoy this aspect of their work, and rather than be assigned community service projects from management, they prefer to choose the topics and locations and often seek out science-related opportunities. In a survey of 451 television news anchors, 83 percent said their stations had no guidelines regarding those appearances and most anchors said these opportunities bring attention to important issues (Bradshaw et al., 2003). Half of those news anchors reported making one community appearance a week, a quarter twice a week and 11 percent three times a week (86 percent at least once a week). This is especially true of television weathercasters, who are among the most popular anchors in their communities. One television weathercaster in a workshop survey reported an average of 150 of these community appearances annually. Weather, of course, is one of the main subjects weathercasters discuss on these visits, but they also get the latitude to talk more about science in general. On school visits, they encourage students to pursue science careers, explain the value of science to society, and discuss current science issues in the news. Especially during ratings periods when high-profile weathercasters are often sent into the field to report "live," appropriate science venues offer opportunities for greater visibility and attention to the topic in general.

Paul Gross, senior meteorologist for WDIV-TV in Detroit, coordinates the station's science and environmental reporting and also works closely with outside agencies, earning him the title "Science Guy" in his community. He says viewers connect to on-air science stories and that has been a boost to their ratings, but he also notes the importance of being in the community with a variety of science based projects, such as their formal partnership with the Detroit Museum of Science, which he says enhances the station's and his reputation. As Brian Busby, chief meteorologist for KMBC-TV in Kansas City, and former AMS board member notes, successful weathercasters today must be involved in their communities to succeed (Bowser, 1997).

6. Conclusions

Science communication occurs in many ways and forms in US society and is studied in many ways as well. An overlooked and perhaps very important method of public science communication occurs with local television weathercasters, the subjects of this research. While ample attention has been paid to such agents as school, family, religion and the workplace, the influence of the media as community educators is just beginning to be appreciated, let alone understood (Brookfield, 1990). Limited research shows that most adults learn the bulk of what they know about contemporary science from mass media (Durant et al., 1989; Atwater, 1988), although the focus of that previous research was newspapers. The purpose of the weather forecast should be to help people make better weather-information-dependent decisions (Brooks et al., 1997). In addition, this research argues that television weathercasters already serve as more than just forecasters and act as mass media science communicators,

both formally and informally, that this function is increasing in prominence, and that a variety of organizations are seeking to capitalize on their unique status.

Even in television's early days, viewers said they wanted their news anchors to be knowledgeable and experienced because that instilled credibility (Cathcart, 1969–70). Many local television weathercasters today enjoy the highest audience credibility scores in their communities. "There isn't a politician, entertainer, or athlete in the world who wouldn't kill for a fraction of the power that television weathercasters command from the public's attention" (Guterl, 2002: 48).

In this research, a majority of television weathercasters said their newscasts are appropriate places to educate their audiences about scientific topics beyond weather and more than half of them said they've already reported on global climate change (the only specific topic included in this particular survey). Evidence suggests this reach extends beyond climatology, a cousin to meteorology, and includes a wide range of science-related topics.

Getting proper training to report on tangential science issues is crucial, and a number of agencies are reaching out to television weathercasters to provide that kind of information. The American Meteorological Society is coordinating with several other organizations to transform AMS seal holders into "station scientists," and the organization unveiled a new website in January 2006 to assist weathercasters in this endeavor (AMS, 2006a). This effort includes upgrading a new on-air credential that requires ongoing professional development and training in a wider range of science topics, workshops at both the 2003 and 2005 broadcast conferences, and the website that includes video examples of other weathercasters' science reporting, strategies for writing and storytelling, scientific contacts and resources, and a discussion forum. Instead of going to an outside source, or a reporter, to cover science and environmental stories, the AMS wants news managers to turn to the trained specialist in their own weather department (McPherson, 2004). The initiative has garnered the influential support of the President of the Radio and Television News Directors' Association, who encourages news directors to explore the concept of expanding their weathercasters' duties to become station scientists (Cochran, 2004).

Another organization preparing television weathercasters to become more involved in science reporting is the National Environmental Education and Training Foundation (NEETF) (http://www.neetf.org/). NEETF is a private non-profit created by Congress in 1990 that creates public–private partnerships to increase environmental knowledge. On the basis of poor results from their "environmental scorecard," Vice President for Programs Deborah Sliter says NEETF is targeting weathercasters to combat this illiteracy because they consider them: "the single largest cadre of trained scientists in the media today who are also highly skilled communicators." Sliter adds that "of the many forms of news reporting, television weather reporting shows particular promise for providing the viewing public with organized information on environmental systems and causal relationships important to public understanding of environmental science."

The first of NEETF's projects, entitled "Eyes on the Environment," focused on watersheds. Working with WRC-TV Chief Meteorologist Bob Ryan in Washington DC, NEETF and StormCenter Communications created a variety of products to increase audience understanding of the Chesapeake Watershed. StormCenter Communications reports more than 2.8 million hits and 150,000 unique visitors to the watershed and environment section of the WRC-TV website.

Ryan is just one television weathercaster who has become a big advocate of "turning the weathercast into an 'envirocast'" (Ryan, 2003). Ryan encourages his colleagues to do more than just forecast the weather and help better educate the public by including additional science and environmental information into their broadcasts. He concludes by saying, "people are interested in more than just the weather, and weather broadcasters are uniquely positioned

to tie environmental issues together and make themselves even more valuable to their communities and to their stations" (p. 1). The days of television meteorologists doing little more than predicting the weather may be numbered as the forecasts of the future increasingly will include tips for viewers on how to dodge environmental threats and manage their health (Bickerstaff, 2003).

Data from this research also reveal opportunities for science communication beyond just the on-air newscasts, or other resources on the station's websites. A consistent 15 percent of all television weathercasters' job descriptions include community service, often speaking about science-related topics before school and civic groups and many weathercasters make more than 100 such appearances annually. Many television weathercasters are already capitalizing on this opportunity to serve as science communicators in their communities. Future research, including analyses of the kinds of science projects already being conducted by television weathercasters across the country, as well as content analyses of weathercasts themselves, are under way to better understand this science communication function more clearly.

The baseline findings offered here also serve as a foundation for future longitudinal research that may facilitate measurement of changes over time. In general, findings suggest a striking similarity in the daily duties of television weathercasters across a wide range of tested variables, including market size, training, years of experience, science credentials and newscast position.

Data reveal that weather staffs in top 25 markets are the largest, and with more daily newscasts, creating opportunities to report on science and environmental issues. This is especially true for weekend weathercasters, who typically report other days of the week. As just one example, WCVB-TV in Boston recently extended the responsibilities of weekend meteorologist J.C. Monahan to include environment and science stories during the week. "These are stories with a scientific background angle and she has the knowledge to work on them," says Monahan's news director Coleen Marren (Whitney, 2003: 36).

Much consideration has been given to the idea of improving science literacy through traditional classroom means, as well as other avenues, but this study argues that perhaps the greatest impact from increased quantity, quality and reach for science communication occurs with local television weathercasters.

To use a weather-related metaphor, the sky is the limit to learn more about this potential role from a variety of research approaches. This descriptive study gives us a place to begin and to build upon as we investigate this role of television weathercasters—perhaps the most visible and least understood science communicators in our culture.

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